

**MARINE MAMMAL MONITORING AND MITIGATION PLAN
FOR 2016 ANCHOR RETRIEVAL PROGRAM
CHUKCHI AND BEAUFORT SEAS
ALASKA**

*Prepared for
Fairweather LLC
301 Calista Court
Anchorage, Alaska 99518*



*Prepared by
Fairweather Science LLC
301 Calista Court
Anchorage, Alaska 99518*



*February 2016
Revised April 2016*

TABLE OF CONTENTS

1.0	INTRODUCTION.....	4
2.0	DESCRIPTION OF ACTIVITIES.....	5
2.1	Description of Moorings	5
2.2	Description of Vessels	5
2.3	Description of Retrieval Program	8
2.4	Description of Side Scan Sonar	8
2.5	Description of Retrieval Process.....	9
2.6	Ice Forecasting and Management	9
3.0	VESSEL-BASED MONITORING	11
3.1.1	NMFS Acoustic Thresholds	11
3.1.2	Shut Down/Power Down Procedures	12
3.1.3	Speed or Course Alteration	13
3.2	Monitoring Methodology.....	13
3.3	Protected Species Observers	14
3.3.1	Number of Observers	14
3.3.2	Crew Rotation	15
3.3.3	Observer Qualifications and Training	15
3.3.4	PSO Handbook.....	15
3.4	Required Monitoring and Reporting.....	16
3.5	Marine Mammal Behavioral Response to Vessel Disturbance Study	16
4.0	REFERENCES.....	18

LIST OF FIGURES

Figure 1. 2016 Anchor Retrieval Locations..... 6

Figure 2. Photos of AHTSVs to be Used During Anchor Handling Program. 7

LIST OF TABLES

Table 1. Anchor Retrieval Proposed Vessels..... 7

Table 2. Summary of Distance to NMFS Thresholds. 12

ACRONYMS AND ABBREVIATIONS

4MP	Marine Mammal Monitoring and Mitigation Plan
AHTSV	Anchor Handling Towing Supply Vessels
CFR	Code of Federal Regulations
Com Center	North Slope Communications Centers
dB re 1 μ Pa	decibels referenced to one microPascal
DP	Dynamic Positioning
EZ	Exclusion Zone
FWS	Fairweather Science LLC
FWX	Fairweather LLC
GPS	Global Positioning System
IHA	Incidental Harassment Authorizations
LBCHU	Ledyard Bay Critical Habitat Unit
LOA	Letter of Authorization
m	meters
MMPA	Marine Mammal Protection Act
MODU	Mobile offshore drilling unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OSRV	Oil spill response vessel
PSO	Protected Species Observer
rms	root-mean-square
ROV	Remotely-Operated Underwater Vehicle
Shell	Shell Exploration & Production Company
USC	United States Code
USFWS	United States Fish and Wildlife Service

1.0 INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) administer regulations governing the issuance of Incidental Harassment Authorizations (IHAs) and Letters of Authorization (LOAs) permitting the incidental, but not intentional, take of marine mammals under certain circumstances. The regulations are codified in 50 Code of Federal Regulations (CFR) Part 216, Subpart I (Sections 216.101-216.108). The Marine Mammal Protection Act (MMPA) defines ‘take’ to mean “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal” (16 United States Code [USC] Chapter 31, Section 1362 (13)).

Fairweather LLC (FWX) or Fairweather Science, LLC (FWS), if individually or collectively (Fairweather), plan to retrieve large seafloor anchors and associated gear that were deployed as part of Shell Exploration and Production Company’s (Shell) exploratory drilling program at five locations in Kotzebue Sound, Chukchi Sea, and Beaufort Sea during the 2016 open water season (early July through October). The retrieval program will be funded by Shell but all aspects of the program will be operated by FWX or FWS individually, or collectively by Fairweather.

FWS requests an IHA pursuant to Section 101(a)(5)(D) of the MMPA, 16 USC § 1371 (a)(5) to allow non-lethal takes of whales and seals incidental to the 2016 anchor retrieval program. The aspects of the retrieval program that have the potential to incidentally harass marine mammals are the underwater noise associated with vessels actively handling the anchors (due to use of thrusters to maintain position and unseat the anchors), the potential use of a side scan sonar to obtain high resolution imagery of the site before and after the retrieval operations, and the very unlikely event of ice management near Point Barrow. All activities will take place during the open water season and will avoid subsistence whale harvest activities. The activities at each of the anchor array sites will take place over a two to seven day period, so all potential impacts will be temporary and localized.

FWS will manage a Marine Mammal Monitoring and Mitigation Plan (4MP) for these activities. This Plan includes only vessel-based observations by experienced Protected Species Observers (PSOs).

The objectives of the 4MP include:

- Establish real-time mitigation procedures as required by the IHA and LOA.
- Collect information needed to estimate the number of exposures of marine mammals to sound levels that may result in harassment, which must be reported to NMFS and USFWS.
- Collect data on occurrence and activities of marine mammals in the area and timing of the anchor retrieval activities.
- Provide an opportunity to collect information on behavioral responses of marine mammals to vessels.
- Provide a communication channel to coastal communities and whalers.

2.0 DESCRIPTION OF ACTIVITIES

As part of Shell's exploratory drilling program in 2012 and 2015, large anchors were deployed at five locations: 1) Good Hope Bay in Kotzebue Sound for barge moorings, 2) Burger A site in the Chukchi Sea for the arctic containment system moorings, 3) Burger V site in the Chukchi Sea for the M/V *Noble Discoverer* (Discoverer) drilling rig moorings, 4) Kakapo in the Chukchi Sea for a contingency location for the Discoverer drilling rig, and 5) Sivulliqliq site in the Beaufort Sea for the mobile offshore drilling unit (MODU) *Kulluk* (Kulluk) drilling rig moorings (Figure 1). The mooring systems at each site include anchors, chain, wire rope, clump weights, connecting gear, and float ropes. The anchors and all associated gear are scheduled for retrieval.

2.1 DESCRIPTION OF MOORINGS

Each mooring site is configured differently based on the purpose of the mooring. These mooring systems are designed to hold drilling rigs or large barges in place by connecting the mooring line to the marine asset to anchor it to the seafloor. A mooring system consists of a mooring line that will include a combination of chain, wire rope, and synthetic fiber rope; connectors (shackles, links, swivels, etc.); and an anchoring point (drag anchor, clump weight, etc.). When Shell departed the Chukchi and Beaufort Seas, these mooring systems were left in place at the five locations shown in Figure 1. The arrays vary in size and configuration and will be retrieved with the use of three specialized Anchor Handling Towing Supply Vessels (AHTSV) and the oil spill response vessel (OSRV) *Nanuq* during the open water season of 2016.

2.2 DESCRIPTION OF VESSELS

These specialized AHTSVs are designed specifically to handle large mooring systems. They have large winches for towing and anchor handling, large deck space to allow for storage of anchors and chain, lockers for chain, and have more power to increase the pull. While the vessel arrangements are still being finalized, the likely fleet of vessels will include four vessels: M/V *Aiviq*, M/V *Ross Chouest*, M/V *Nanuq*, and M/V *Dino Chouest*. All but the *Dino Chouest* have previously worked in the Arctic as part of Shell's exploration program. One of the AHTSVs (*Dino Chouest*) will carry a Remotely Operated Underwater Vehicle (ROV) specifically designed to manipulate float ropes. A description of each of the AHTSV is provided in Table 1. Photos of the vessels are provided in Figure 2.

Figure 1. 2016 Anchor Retrieval Locations.

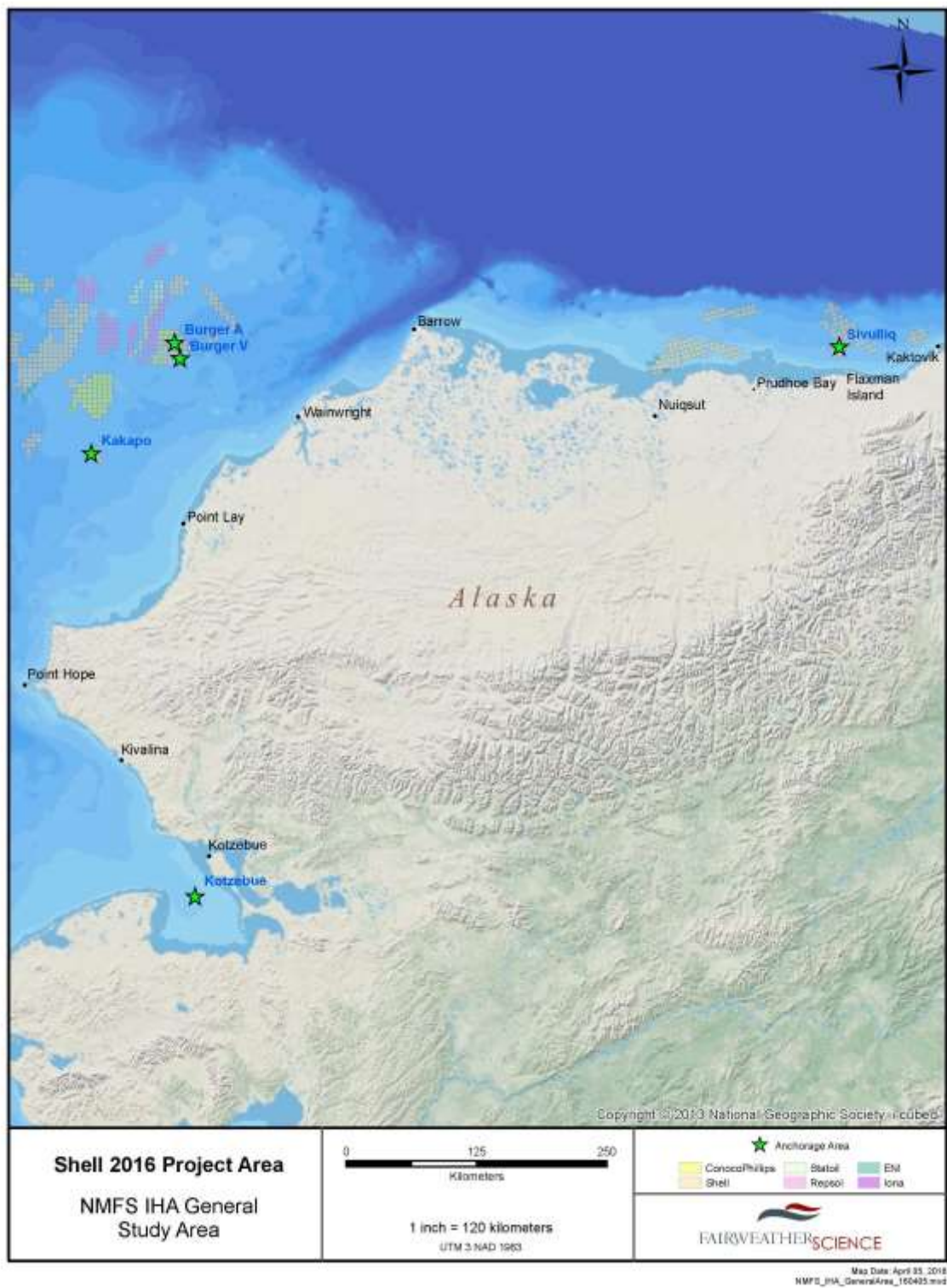




Figure 2. Photos of AHTSVs to be Used During Anchor Handling Program.

Table 1. Anchor Retrieval Proposed Vessels.

Vessel Name	Specification	Length	Width	Draft	Maximum Speed	Available Fuel Storage
M/V <i>Aiviq</i>	Anchor handling Ice Classed* Refueling Support	360 feet	80 feet	28 feet	15 knots	527,073 gallons
M/V <i>Ross Chouest</i>	Anchor handling	256 feet	54 feet	18 feet	12 knots	149,157 gallons
M/V <i>Nanuq</i>	Anchor handling Ice Classed* Refueling Support	301 feet	60 feet	21 feet	15 knots	323,065 gallons
M/V <i>Dino Chouest</i>	Anchor handling ROV	348 feet	72 feet	24.9 feet	15 knots	508,337 gallons
*As discussed below, minimal ice management will occur. To the extent necessary, operated vessels may contact small ice floes (that do not have marine mammals visibly on them) in order to maximize survey efficiency. In other words, these vessels (M/V <i>Aiviq</i> and M/V <i>Nanuq</i>) do not need to avoid ice for safety reasons.						

2.3 DESCRIPTION OF RETRIEVAL PROGRAM

The goal of the retrieval program will be to complete operations efficiently and safely within one season, taking into consideration ice, weather, and subsistence harvest activities. Preliminary calculations indicate the vessels will have sufficient fuel onboard to have the endurance to remain offshore with minimal fuel transfers at sea. The number of crew changes and vessel resupply will depend on the progress of the retrieval program, but, if necessary, will take place in Kotzebue, Wainwright, or Prudhoe Bay. Through the Olgoonik Fairweather LLC joint venture, FWS has provided crew change and logistic support for multiple vessels in all three locations since 2008. A small, flat-bottom crew change vessel is available at each location to transfer personnel, equipment, and groceries from shore to the AHTSV. Helicopters will not be used in this program, unless in an emergency situation. FWS will work closely with communities at each potential crew change location to avoid conflict with any subsistence activities, as we have successfully accomplished since 2008.

Vessels will mobilize from Dutch Harbor in late June to arrive in the Kotzebue area by early July. Delmar (the owners of some of the mooring systems and provider of onboard anchor handling technicians) and Fairweather have developed multiple scenarios to retrieve all of the systems within one season. Each AHTSV is a different size and each will hold different amounts of equipment depending on deck space, storage reel space, chain locker space, storage location, and equipment type to meet stability requirements. Timing and movement of the four vessels is a complex planning exercise. It is likely that one or two vessel transits to Dutch Harbor to offload anchors will be required.

The goal will be to arrive at Kotzebue Sound and retrieve these systems in early July. FWS will work closely with the communities (Kotzebue, Kivalina, and Shishmaref) to ensure there are no conflicts with the beluga whale harvest. If subsistence harvest activities are taking place, anchors will not be retrieved until cleared (by the communities) to do so. The vessels will move into the Chukchi Sea to retrieve the Burger and Kakapo anchors, depending on ice presence. As soon as the passage to the Beaufort Sea around Point Barrow is ice free and safe, two of the four vessels will immediately transit to the Sivulliq site. Typically, this occurs in late July/early August. Retrieval operations will be completed and vessels will be out of the Beaufort prior to the August 25th commencement for the Nuiqsut/Kaktovik bowhead whale harvest. Once the Sivulliq anchors are retrieved, the two vessels will return to the Chukchi Sea to complete any remaining operations.

2.4 DESCRIPTION OF SIDE SCAN SONAR

The deployed locations of each anchor are known, but components of the mooring systems may have shifted over time and there may be significant marine vegetation growth. The ROV used to manipulate the float ropes is equipped with a camera to give the operators a visual of the equipment once onsite. However, only one vessel is equipped with an ROV; therefore, to facilitate the efficiency and safety of the retrieval process, Fairweather may obtain high resolution geo-referenced imagery using a side scan sonar prior to the beginning of retrieval operations at each site. This imagery will provide the anchor handlers with an accurate picture of exactly where equipment is located to allow safe and efficient retrieval. Fairweather may also survey each site after retrieval is complete to confirm all anchors and associated gear have been removed.

The side scan sonar survey will be conducted from the R/V *Norseman II*, operated by Olgoonik Fairweather, LLC. The *Norseman II* has operated in the Arctic for industry and research organizations since 2007. This vessel will operate independently from the AHTSVs with the goal of reaching the anchor sites prior to the

AHTSVs' arrival. The side scan sonar will be towed over the anchor site array in a grid pattern sufficient to produce a mosaic of the entire site. Each survey is expected to last a period of one to three days. In the event that a multi-beam sonar is used it will be pole mounted on the side of the survey vessel whereas a side scan sonar would be towed. The imagery will be provided immediately to the vessel operators so they will be able to develop a detailed plan for the retrieval based on actual conditions of the equipment. The *Norseman II* will be in the Bering Strait region starting in early June conducting scientific research for other organizations. As soon as the ice allows, the *Norseman II* will transit to the Kotzebue Sound to collect the imagery and then up to the Chukchi Sea. As with the anchor handling vessels, the timing of transiting to the Beaufort Sea will depend on distribution of ice around Point Barrow.

2.5 DESCRIPTION OF RETRIEVAL PROCESS

Once on site, the retrieval of each anchor and associated mooring system typically takes approximately four hours to complete. There are typically two vessels onsite, only one of which be retrieving an anchor. Depending on weather and number of the mooring lines/anchors, one site is expected to be completed in between two and seven days. Anchors will be retrieved in one of two ways. The first is by locating the float rope connected to each of the mooring systems with the ROV and retrieving the anchor from the opposite side of the anchor, working towards the anchor itself. The second method will be employed if the float rope cannot be located, or the vessel retrieving does not have an ROV. A grapple hook will be deployed to grasp the mooring chain along the anchoring system. From that point, the anchor system will be pulled onto the back deck with retrieval on the non-anchor side first, then the anchor side, and all the way to the anchor.

Over this period, the anchor winch and thrusters will be used to unseat and retrieve anchors from the seafloor. Depending on water depth and anchor depth, this typically takes 15-20 minutes per anchor. Thruster usage while maintaining station using Dynamic Positioning (DP) will vary depending on weather and sea conditions. Thruster percentages are automatically increased and decreased based on the sea state and weather. If weather conditions are poor, the thrusters will need to work harder to maintain position. Anchors at Burger A and Kakapo locations are wet stored (they were not seated deeply in place) and will not require unseating.

2.6 ICE FORECASTING AND MANAGEMENT

The anchor retrieval program is located in an area characterized by active sea ice movement, ice scouring, and storm surges. In anticipation of potential ice hazards that may be encountered, we will utilize real-time ice and weather forecasting to identify conditions that could put operations at risk, allowing the vessels to modify their activities accordingly. These observations will be made by experienced ice and weather specialists whose sole duty is to provide information and provide advice on any ice-related threats. These observers and advisors will be based in Anchorage. This real-time ice and weather forecasting will be available to personnel for planning purposes and as a tool to alert the fleet of impending hazardous ice and weather conditions. Potential data sources for ice forecasting and tracking include:

- Potential unmanned aerial support operated by Tulugaq II LLC from vessels for ice scouting.
- Radarsat Data Synthetic Aperture Radar - provides all-weather imagery of ice conditions with very high resolution.
- Moderate Resolution Imaging Spectroradiometer (MODIS) - a satellite providing lower resolution visual and near infrared imagery.

- Other publically available remote sensing satellite data such as Visible Infrared Imaging Radiometer Suite, Oceansat-2 Scatterometer, and Advanced Very High Resolution Radiometer.
- Reports from Ice Specialists on the ice management vessel and anchor handler and from the Ice Observer on the vessels.
- Information from the NOAA ice centers and potentially the University of Colorado.

The proposed 2016 anchor handling fleet will consist of two ice-classed vessels. The only time ice management is likely for this project is around Point Barrow. The goal of the project is to transit into the Beaufort Sea as soon as ice conditions allow, which is typically in late July. If vessels transit into the area and ice moves in, they may be required to manage ice floes. Fairweather does not anticipate active ice management except for a few days near Point Barrow during the transit. Therefore, we have analyzed potential impacts of ice management for two days in the Barrow area.

3.0 VESSEL-BASED MONITORING

Vessel-based NMFS-approved PSOs will monitor for marine mammals during vessel operations (including anchor handling) during all daytime hours. Vessel-based marine mammal monitoring and mitigation methods were designed to meet the requirements and objectives specified in this IHA and any LOA potentially obtained as a result of this program. The main purposes of PSOs aboard the vessels are to conduct visual watches for marine mammals to serve as the basis for implementation of mitigation measures, document numbers of marine mammals present, record any reactions of marine mammals to anchor-handling related activities, and identify whether there was any possible effect on accessibility of marine mammals to subsistence hunters in northern Alaska. These observations will provide the real-time data needed to implement some of the key measures.

For this program, it is not feasible to implement a power down or shut down procedure because once the anchor has been connected to the winch, stopping or even slowing the retrieval process could have major safety consequences. Accordingly, once the anchor is connected, we will not be able to stop operations if a marine mammal enters the zone. The PSOs will observe for marine mammals out to the horizon; detectability will depend on environmental conditions, height on vessel, distance of the marine mammal, and species. It is not feasible to visually monitor from the vessel to the 120 dB Level B safety zone for the anchor handling (12,000 m) because of the distance, but it is feasible to monitor the 160 dB Level B safety zone for anchor handling, side scan sonar, and ice management activities. Because the Level A zone is so small, we are electing to monitor the 160 dB zone instead.

The specific objectives of the vessel-based program provide:

- the basis for real-time mitigation as required by the various permits,
- information needed to estimate the number of “takes” of marine mammals by harassment, which must be reported to NMFS and USFWS,
- data on the occurrence, distribution, and activities of marine mammals in the areas where the program was conducted,
- information to compare the distances, distributions, behaviors, and movements of marine mammals relative to the anchor handling activities, and
- a communication channel to coastal subsistence communities, including Iñupiat subsistence hunters.

Once on an anchor site, the vessels will work 24 hours a day to efficiently remove all anchors. During this time period (July and August), there is minimal nighttime. PSOs will monitor as long as daylight conditions allow which varies throughout the season. Vessel captain and crew will watch for marine mammals (insofar as practical at night) and will utilize the same procedures prior to anchor retrieval.

3.1.1 NMFS Acoustic Thresholds

Under current NMFS guidelines (e.g., NMFS 2000), acoustic thresholds for injury (exclusion zone) are defined as the distances within which received levels exceed 180 dB threshold for cetaceans and 190 dB threshold for pinnipeds. The 180 dB and 190 dB thresholds guidelines are also employed by USFWS for Pacific walrus and polar bear. Acoustic thresholds for harassment (safety zone) are defined as 160 dB for impulsive sounds and 120 dB for non-impulsive sounds for all marine mammals.

The distances to the acoustic thresholds are provided in Table 2 and the method for calculation provided in the text below:

Table 2. Summary of Distance to NMFS Thresholds.

Activity	Distance to NMFS Thresholds			
	190 dB	180 dB	160 dB	120 dB
Anchor Handling	3 m	10 m	100 m	22,104 m
Side Scan Sonar	32 m	100 m	1000 m	--
Ice Management	3 m	10 m	100 m	9,600 m

- 1) The distances to the thresholds for anchor handling activity at each site were calculated using Method 2 as described in Section 6 in the IHA application, per NMFS instructions. This method uses the modeled ensonified area of 1,535 km² from the 2015 Shell IHA application (Shell 2015). The IHA application or associated 4MP does not provide the distances to the zones specifically for anchor handling activities, but assuming a simple spreading loss of 20 log R, the extrapolated distances to the thresholds are provided in Table 2. Because distances to the exclusion zones for anchor handling and ice management are so close to the vessel, we propose to use the 160 dB safety zone of 100 m as a monitoring zone for all marine mammals. Although both methods require extrapolation to the 120 dB, this is the worst-case estimate and therefore most conservative.
- 2) The distances to the thresholds for side scan sonar activity were calculated using Method 1 as described in Section 6, per NMFS instructions. Manufacturer specifications for single and multi-beam sonar provide a source level of 220 dB re 1 µPa at 1 m (Teledyne Benthos Geophysical 2008; Konsberg 2014). Assuming a simple spreading loss of 20 log R, the extrapolated distances are provided in **Error! Reference source not found.** Even though the side scan sonar is above 200 kHz and not typically regulated by NMFS (Shane Guan, personal communication), we will implement a shut down if a marine mammal enters the 180 dB exclusion zone of 100 m. We will monitor the 160 dB safety zone of 1000 m for behavioral responses.

3.1.2 Shut Down/Power Down Procedures

Mitigation measures typically used in industry programs include powering or shutting down activities if a marine mammal is in or approaching an established zone (based on distances to 190 or 180 dB). For the anchor handling and ice management portions of the program, it is not feasible to implement a power down or shut down procedure. Each anchor weighs between 4,500 and 20,000 pounds; once the anchor has been connected to the winch and is being slowly hauled in, stopping or even slowing the retrieval process could have major safety consequences to the vessel. Accordingly, once the anchor is connected, we will not be able to stop operations if a marine mammal enters the safety zone.

FWS proposes the following mitigation and monitoring scenarios prior to and during actual **anchor retrieval and ice management** to reduce potential exposures of sound on marine mammals.

- When the vessel is positioned on-site, the PSO will ‘clear’ the area by observing the 160 dB safety zone (100 m) for 30 minutes; if no marine mammals are observed within those 30 minutes, anchor retrieval will commence.
- If a marine mammal(s) is observed within the 160 dB safety zone during the clearing, the PSO will continue to watch until the animal(s) is gone and has not returned for 15 minutes if the sighting was a pinniped, or 30 minutes if it was a cetacean.

- Once the PSO has cleared the area, anchor retrieval operations may commence.
- Should a marine mammal(s) be observed within the 160 dB safety zone during the retrieval operations, the PSO will monitor and carefully record any reactions observed. PSOs will also collect behavioral information on marine mammals beyond the safety zone.

FWS proposes the following mitigation and monitoring scenarios for the **side scan sonar activity**:

- Prior to starting the sonar activity, the PSO will ‘clear’ the area by observing the 180 dB exclusion zone (100 m) for 30 minutes; if no marine mammals are observed within those 30 minutes, sonar activity will commence.
- If a marine mammal(s) is observed within the 180 dB exclusion zone during the clearing, the PSO will continue to watch until the animal(s) is gone and has not returned for 15 minutes if the sighting was a pinniped, or 30 minutes if it was a cetacean.
- Once the PSO has cleared the area, sonar activity may commence.
- If an animal enters the 180 dB exclusion zone, sonar will be shut down immediately. Sonar activity will not resume until the marine mammal has cleared the exclusion zone. PSOs will also collect behavioral information on marine mammals beyond the exclusion zone.

3.1.3 Speed or Course Alteration

If a marine mammal is detected outside the 160 dB safety zone for anchor handling or ice management (100 m) or the 180 dB exclusion zone for side scan sonar activities (100 m) and, based on its position and the relative motion, is likely to enter those zones, the vessel's speed and/or direct course may, when practical and safe, be changed. The marine mammal activities and movements relative to the vessels will be closely monitored to ensure that the marine mammal does not approach within either zone. If the mammal appears likely to enter the respective zone, further mitigative actions will be taken, i.e., either further course alterations or shut down in the case of the sonar.

3.2 MONITORING METHODOLOGY

Each of the vessels will be staffed with a minimum of two PSOs. PSOs will be on watch during all daylight periods. The observer(s) will watch for marine mammals from the best available vantage point on vessel. Ideally this vantage point is an elevated stable platform from which the PSO has an unobstructed 360° view of the water. The PSOs will scan systematically with the naked eye and 7 x 50 reticle binoculars. When a mammal sighting is made, the following information about the sighting will be carefully and accurately recorded:

- Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from the PSO, apparent reaction to activities (e.g., none, avoidance, approach, paralleling, etc.), closest point of approach, and behavioral pace.
- Time, location, speed, activity of the vessel, sea state, ice cover, visibility, and sun glare.
- The positions of other vessel(s) in the vicinity of the PSO location.
- The vessel's position, speed, water depth, sea state, ice cover, visibility, and sun glare will also be recorded at the start and end of each observation watch, every 30 minutes during a watch, and whenever there is a change in any of those variables.

Distances to nearby marine mammals will be estimated with binoculars (Fujinon 7x50 binoculars) containing a reticle to measure the vertical angle of the line of sight to the animal relative to the horizon. Personnel on the bridge will also assist the PSOs in watching for marine mammals. PSOs are instructed to identify animals as unknown when appropriate rather than strive to identify an animal when there is significant uncertainty. FWS also will ask that the PSOs provide any sightings cues they used and any distinguishable features of the animal even if they are not able to identify the animal and record it as unidentified. Emphasis is also placed on recording what was not seen, such as dorsal features. In addition to routine PSO duties, observers will be encouraged to record comments about their observations into the “comment” field in the database. Copies of these records will be available to the observers for reference if they wish to prepare a statement about their observations. If prepared, this statement would be included in the 90-day reports documenting the monitoring work. Throughout the anchor handling program, the PSOs will prepare daily, weekly, and monthly reports as required summarizing the recent results of the monitoring program. The reports will summarize the species and numbers of marine mammals sighted. These reports will be provided to agencies as required and/or requested.

An electronic database will be used to record and collate data obtained from visual observations. The PSOs will enter the data into the data entry program installed on field laptops. The program automates the data entry process, reduces data entry errors, and maximizes PSO time spent looking at the water. PSOs also have voice recorders available to them that will allow PSOs to maximize time spent focused on the water. Quality control of the data will be facilitated by; (1) the start-of-season training session, (2) subsequent supervision by the onboard field crew leader, and (3) ongoing data checks during the field season. The data will be sent from the vessel to Anchorage regularly, and backed up regularly onto storage devices on the vessel.

3.3 PROTECTED SPECIES OBSERVERS

Vessel-based monitoring for marine mammals will be conducted by trained PSOs on vessels throughout the program to comply with mitigations contained in FWS’s MMPA authorization(s). The observers will monitor the occurrence and behavior of marine mammals near the anchor handling and side scan sonar vessels during all daylight periods during the program, and during most periods when anchor handling is not being conducted. PSO duties will include watching for and identifying marine mammals; recording their numbers, distances, and reactions to the activities; and documenting exposures to sound levels that may constitute harassment as defined by NMFS.

3.3.1 Number of Observers

A sufficient number of PSOs will be onboard to meet the following criteria

- 100 percent monitoring coverage during all periods of exploration drilling operations in daylight.
- Maximum of four consecutive hours on watch per PSO.
- Maximum of approximately 12 hours on watch per day per PSO.

PSO teams will consist of trained field biologist and Alaska Natives observers. An experienced field crew leader will be on every PSO team aboard each anchor handling vessel during the program. PSOs will help ensure that the vessel communicates with the Communications and Call Centers (Com Centers) in Native villages along the Chukchi Sea coast.

3.3.2 Crew Rotation

FWS anticipates that there will be provisions for crew rotation at least every three to six weeks to avoid observer fatigue. During crew rotations detailed notes will be provided to the incoming crew leader. Other communications such as email, fax, and/or phone communication between the current and oncoming crew leaders during each rotation will also occur when necessary. In the event of an unexpected crew change FWS will facilitate such communications to ensure monitoring consistency among shifts.

3.3.3 Observer Qualifications and Training

Crew leaders serving as PSOs will have experience from one or more projects with operators in Alaska or the Canadian Beaufort. Biologist-observers will have previous PSO experience, and crew leaders will be highly experienced with previous vessel-based marine mammal monitoring projects. All PSOs will be trained and familiar with the marine mammals of the area. A PSO handbook, adapted for the specifics of the planned FWS anchor retrieval program will be prepared and distributed beforehand to all PSOs. All observers will also complete a training session on marine mammal monitoring, to be conducted shortly before the anticipated start of the season. The training sessions will be conducted by marine mammalogists with extensive crew leader experience from previous vessel-based monitoring programs in the Arctic.

Primary objectives of the training include:

- Review of the 4MP for this project, including any amendments adopted, or specified by the NMFS the USFWS or other agreements in which FWS may elect to participate.
- Review of marine mammal sighting, identification, (photographs and videos) and distance estimation methods, including any amendments specified by the NMFS or the USFWS in the MMPA authorizations issued to FWS.
- Review operation of specialized equipment (e.g., reticle binoculars, big eye binoculars, night vision devices, Global Positioning System [GPS]).
- Review of data recording and data entry systems, including procedures for recording data on mammal sightings, exploration drilling and monitoring activities, environmental conditions, and entry error control. These procedures will be implemented through use of a customized computer database and laptop computers.

3.3.4 PSO Handbook

A PSO Handbook will be prepared for FWS's monitoring program. The Handbook will contain maps, illustrations, and photographs as well as copies of important documents and descriptive text and are intended to provide guidance and reference information to trained individuals who will participate as PSOs. The following topics will be covered in the PSO Handbook:

- Summary overview descriptions of the project, marine mammals and underwater sound energy, the 4MP, the NMFS and USFWS MMPA authorizations and other regulations/permits/agencies.
- Monitoring and mitigation objectives and procedures, including exclusion and disturbance zones.
- Responsibilities of staff and crew regarding the 4MP.
- Instructions for staff and crew regarding the 4MP.
- Data recording procedures: codes and coding instructions, common coding mistakes, electronic database; navigational, vessel data recording, field data sheet.
- Use of specialized field equipment (e.g., reticle binoculars, laser rangefinders).

- Reticle binocular distance scale.
- Table of wind speed, Beaufort wind force, and sea state codes.
- Data storage and backup procedures.
- List of species that might be encountered: identification, natural history.
- Safety precautions while onboard.
- Crew and/or personnel discord; conflict resolution among PSOs and crew.
- Drug and alcohol policy and testing.
- Scheduling of cruises and watches.
- Communications.
- List of field gear provided.
- Suggested list of personal items to pack.
- Suggested literature, or literature cited.
- Field reporting requirements and procedures.
- Copies of the MMPA authorizations.
- Areas where vessels cannot operate such as the Ledyard Bay Critical Habitat Unit (LBCHU) and Hanna Shoal Walrus Use Area (HSWUA).

3.4 REQUIRED MONITORING AND REPORTING

The results of vessel-based monitoring, including estimates of exposure to key sound levels, will be presented in weekly, monthly, and 90-day reports. Reporting will address the requirements established by NMFS in the IHA, and USFWS in the LOA (if so stipulated). The technical report(s) will include the list below. Additional reporting guidelines can be found in FWS's 4MP.

- Summaries of monitoring effort: total hours, total distances, and distribution of marine mammals throughout the study period compared to sea state, and other factors affecting visibility and detectability of marine mammals;
- Analyses of the effects of various factors influencing detectability of marine mammals: sea state, number of observers, and fog/glare;
- Species composition, occurrence, and distribution of marine mammal sightings including date, water depth, numbers, age/size/gender categories (when discernable), group sizes, and ice cover;
- Analyses of the effects of anchor handling program:
 - Sighting rates of marine mammals during periods with and without anchor handling activities (and other variables that could affect detectability),
 - Initial sighting distances versus vessel location,
 - Closest point of approach versus vessel location,
 - Observed behaviors and types of movements versus vessel location,
 - Numbers of sightings/individuals seen versus vessel location,
 - Distribution around the drillship and support vessels versus vessel location, and
 - Estimates of "take by harassment".

3.5 MARINE MAMMAL BEHAVIORAL RESPONSE TO VESSEL DISTURBANCE STUDY

As part of the Chukchi Sea Environmental Studies Program (CSESP), marine mammal biologists collected behavioral response data on walruses and seals to the vessel (either R/V *Westward Wind* or *Norseman II*). The objectives of the observer on the CSESP program were to collect information on marine mammal

distribution and density estimates using standard line-transect theory; in other words, the program was not a mitigation program for any particular seismic activity. When in the presence of walruses in the Hanna Shoal Walrus Use Area (HSWUA), we were able to collect behavioral response data to vessel disturbance to walruses (McFarland et al. 2015). Because the vessels in this program will be transiting a large portion of the time, we propose to utilize this opportunity to collect information on responses of marine mammals, particularly walruses and seals, to vessel disturbance. We will utilize the same protocol approved by USFWS in 2014 (Christman et al. 2015).

As part of the standard FWS observation protocol, observers will record the initial and subsequent behaviors of marine mammals, a methodology we refer to as ‘focal following’. Marine mammals will be monitored and observed until they disappear from the PSO’s view (PSOs may have to follow the walruses by moving to new locations in order to keep the walruses in constant view. Observers will also record any perceived reactions that marine mammals may have in response to the vessel. When following the animal use either a notebook or voice recorder to note any changes in behavior and the time when these changes occur. Time of first observation, time of changes in behavior, and time last seen will be recorded. Behaviors and changes in behaviors of marine mammals will be recorded as long as they are in view of the boat. After the animal is out of sight, PSOs will summarize the observation in the notes field of the electronic data collection platform. It may be difficult to find the animal being followed after it dives and if this happens, PSO will stop focal follow observation.

For groups of marine that are too large to monitor each animal one or more focal animals, e.g., cow/calf pair, subadult female, adult male, etc., will be chosen to monitor until no longer observable. For a sighting with more than one animal, the most common behavior of the group will be recorded. Focal animals will be chosen without bias in relation to age and sex, but as observations accumulate and specific age/sex categories are underrepresented, focal animals may be chosen from those underrepresented categories if possible.

A separate section in the 90-day report will be provided with a summary of results of vessel disturbance, with the ultimate goal of a peer-reviewed publication.

4.0 REFERENCES

- Bisson, L.N., H.J. Reider, H.M. Patterson, M. Austin, J.R. Brandon, T. Thomas, and M.L. Bourdon. 2013. Marine mammal monitoring and mitigation during exploratory drilling by Shell in the Alaskan Chukchi and Beaufort seas, July–November 2012: Draft 90-Day Report. Editors: D.W. Funk, C.M. Reiser, and W.R. Koski. LGL Rep. P1272D–1. Rep. from LGL Alaska Research Associates Inc., Anchorage, AK, USA, and JASCO Applied Sciences, Victoria, BC, Canada, for Shell Offshore Inc, Houston, TX, USA, Nat. Mar. Fish. Serv., Silver Spring, MD, USA, and U.S. Fish and Wild. Serv., Anchorage, AK, USA. 266 pp, plus appendices.
- Christman, C., L. Aerts, W. Hetrick, and D. Snyder. 2015. Chukchi and Beaufort Sea Environmental Studies August–October 2014 Polar Bear and Walrus Observations. 90-day Report submitted to USFWS by Olgoonik Fairweather LLC.
- Kongsberg. 2014. Dual-frequency side scan sonar. Technical Brochure-analog dual frequency side scan sonar.[http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/2832A199EEBD3EE9C12574BF0050D4E0/\\$file/GeoAcoustics-DFSS-data-sheet.pdf?OpenElement](http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/2832A199EEBD3EE9C12574BF0050D4E0/$file/GeoAcoustics-DFSS-data-sheet.pdf?OpenElement).
- McFarland, S., L. Aerts, and S. Wisdom. 2015. Assessing disturbance responses of Pacific walruses (*Odobenus rosmarus divergens*) to vessel presence in the Chukchi Sea. Oral presentation at the Society of Marine Mammalogy Conference, San Francisco, CA. December 14–18, 2015.
- NMFS. 2000. Small takes of marine mammals incidental to specified activities; marine seismic-reflection data collection in southern California/Notice of receipt of application. Fed. Regist. 65(60, 28 Mar.):16374–16379.
- Teledyne Benthos Geophysical. 2008. Sonar Imaging Systems, effective July, 2008. 2008 Geophysical Product Catalog.
http://www.tritonimaginginc.com/site/content/software/compatibility/benthos_cd3lpm.pdf